Ogden Air Logistics Center

U.S. AIR FORCE

An Uneasy Marriage?

Merging Scrum and TSP

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Overview

- Who We Are
- CCS-C
- Agile Methods
- Scrum
- TSP
- Our Process
- Successes
- Challenges
- Lessons Learned
- The Future?

Who We Are

Ogden Air Logistics Center is the major organization at Hill AFB and aims to be America's best warfighter sustainment organization. It is one of three such centers assigned to the Air Force Materiel Command, headquartered at Wright-Patterson AFB, Ohio. It is the largest employer in Utah, with more than 23,500 civilian, military, and contractors supporting an estimated 7.5 million production hours.

The center has worldwide engineering, sustainment and logistics management and maintenance support responsibilities for some of the Air Force's most sophisticated weapon systems, including the Minuteman intercontinental ballistic missiles. The center is the Air Force Center of Industrial and Technical Excellence (CITE) for low-observable, 'stealth,' aircraft structural composite materials and provides support for the B-2 Spirit multi-role bomber.

Program management for two of the Air Force's fighter aircraft is performed at this center. Hundreds of F-16 Fighting Falcon jet aircraft annually receive depot maintenance, modification and repair on the base. Additionally, the number of A-10 Thunderbolt II's that receive depot level inspections, modifications and maintenance continues to grow.

The center has responsibilities for Air Force-wide item management, depot level overhaul and repair for all types of landing gear, wheels, brakes and tires and is the logistics manager for all conventional air munitions, solid propellants and explosive devices used throughout the Air Force. The center is the Air Force technical repair center for composites. In addition, the center provides a full range of sustainment and logistics support for space and command, control, communication and intelligence systems.

The center is also responsible for mature and proven aircraft, as well as providing photonics imaging and reconnaissance equipment; aircraft and missile crew training devices; avionic, hydraulic, pneudraulic and radar components; instruments; gas turbine engines; power equipment systems; special purpose vehicles; shelters; and software engineering, development and support.

Who We Are

The 309th Maintenance Wing is a world-renowned source of maintenance, repair, overhaul and modification for the F-22 Raptor, F-16 Fighting Falcon, A-10 Thunderbolt and C-130 Hercules aircraft, as well as the ICBM Minuteman missile system. The wing possesses a skilled workforce of approximately 8,000 military and civilian employees, and its 294 facilities cover 5.2 million square feet of production and support areas at nine operating locations, including repair organizations in the Pacific and in Tucson, Arizona.

Within the 309 MXW are seven major business groups involved with aircraft, commodities, electronics, software and missile maintenance; maintenance support; and aircraft and aerospace assets maintenance, storage and regeneration. Each group has formidable combinations of skilled technicians and strategic commercial relatiionships to successfully respond to customer needs. The growing industrial capabilities have been sharpened by modernizing facilities, acquiring new equipment and refining competitive processes, and genuine concern for customer needs

CCS-C

Command and Control System – Consolidated (CCS-C)

Mission

CCS-C provides consolidated MILSATCOM tracking, telemetry and command (TT&C) capability for 14th Air Force, 50th Space Wing launch and early orbit, on orbit and anomaly resolution space operations.

Features

CCS-C is currently configured to support MILSATCOM satellites across four satellite constellations: Defense Satellite Communications System (DSCS); Milstar; Wideband Global SATCOM (WGS); and Advanced Extremely High Frequency (AEHF) System. CCS-C consists of high specification, commercially available computer servers and workstations running commercially available TT&C software packages on a local area network-based client/server architecture. CCS-C enables customizable Task Automated Operations which dramatically reduce operator workload enabling Air Force Space Command (AFSPC) to decrease operator crew size while ensuring sufficient TACON of America's MILSATCOM satellites. CCS-C is operational at: AETC / 533rd Space Training Squadron at Vandenberg AFB; 14th Air Force / 50th Space Wing / 3rd and 4th Space Operations Squadrons at Schriever AFB, CO. A CCS-C Backup Satellite Operations Center at Vandenberg AFB (BSOC-V) was activated July 2008.

CCS-C

- **CCS-C Software Sustainment Team**
  - **We are a small team of engineers and computer scientists working to establish a software sustainment capability in support of our customer**
  - **Our primary roles at present are**
    - **Develop expertise in the space domain**
    - **Gain system expertise with CCS-C**
    - **Help to fill in the gaps in the existing system documentation**
    - **Improve the quality of the system code**
    - **Establish a process to integrate the contractor and government efforts in the development and sustainment of the system**
    - **Stand up a software sustainment capability at OO-ALC within the next five years**

Agile Methods

The Agile Manifesto

We are uncovering better ways of developing software by doing it and helping others do it. Through this work we have come to value:

Individuals and interactions *over processes and tools*

Working software *over comprehensive documentation*

Customer collaboration *over contract negotiation*

Responding to change *over following a plan*

That is, while there is value in the items on the right, we value the items on the left more.

(From the Agile Manifesto website)

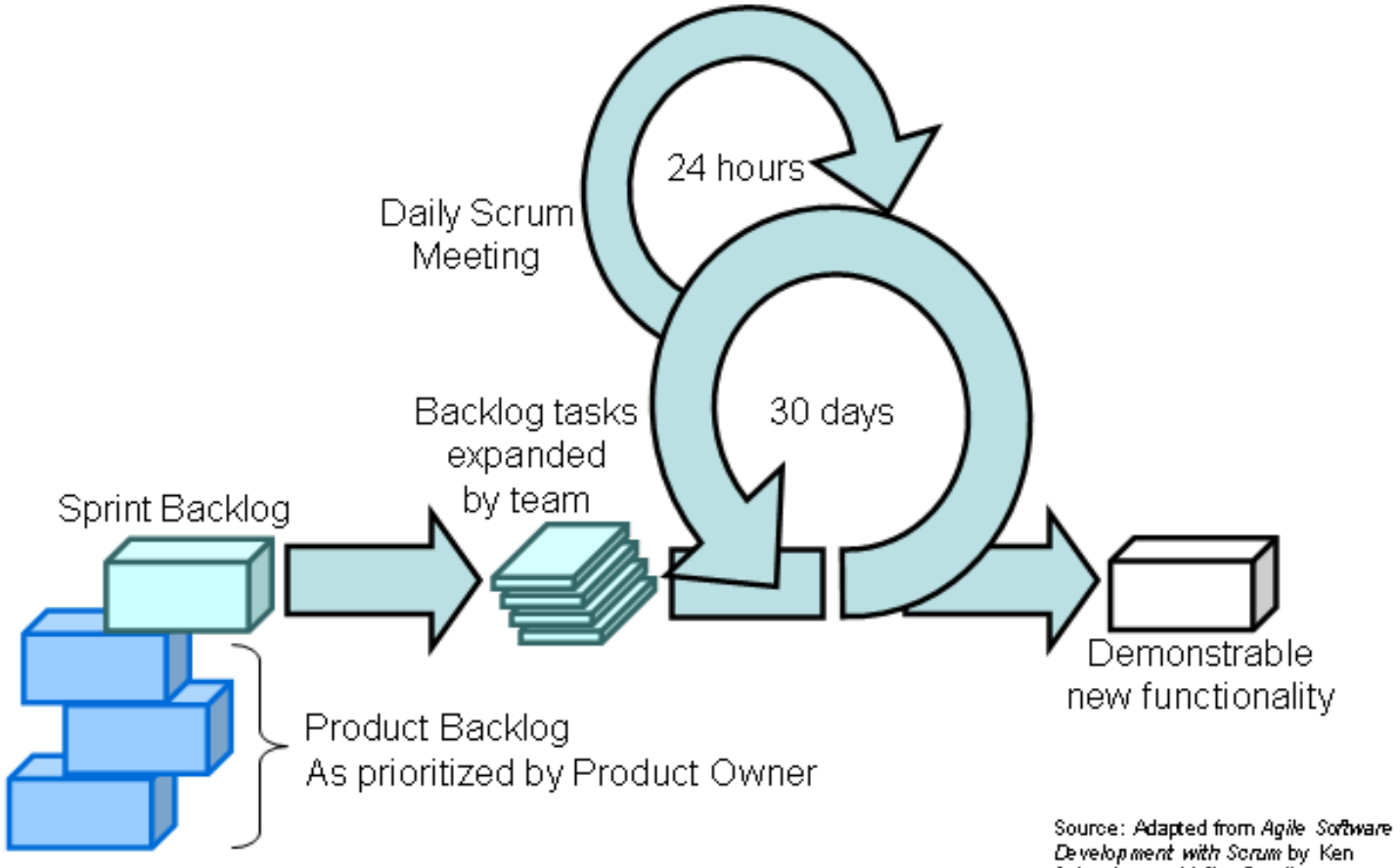
Agile Methods

- Some commonly employed agile methods, according to wikipedia
  - Agile Modeling
  - Agile Unified Process (AUP)
  - Dynamic Systems Development Method (DSDM)
  - Essential Unified Process (EssUP)
  - Extreme Programming (XP)
  - Feature Driven Development (FDD)
  - Open Unified Process (OpenUP)
  - Scrum

Scrum

- Key concepts
  - Sprint
  - Backlog
    - Project
    - Sprint
  - Daily standup
  - Deliverable increment of functionality

Scrum



Source: Adapted from *Agile Software Development with Scrum* by Ken Schwaber and Mike Beedle.

TSP

The Team Software Process (TSP), along with the Personal Software Process, helps the high-performance engineer to

- *** ensure quality software products**
- *** create secure software products**
- *** improve process management in an organization**

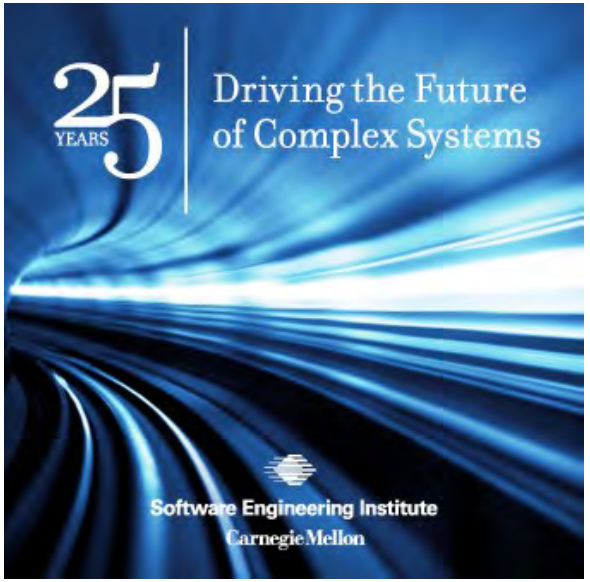
Engineering groups use the TSP to apply integrated team concepts to the development of software-intensive systems. A launch process walks teams and their managers through

- *** establishing goals**
- *** defining team roles**
- *** assessing risks**
- *** producing a team plan**

After the launch, the TSP provides a defined process framework for managing, tracking and reporting the team's progress.

Using TSP, an organization can build self-directed teams that plan and track their work, establish goals, and own their processes and plans. These can be pure software teams or integrated product teams of 3 to 20 engineers.

TSP will help your organization establish a mature and disciplined engineering practice that produces secure, reliable software.



(From the SEI TSP website)

PSP

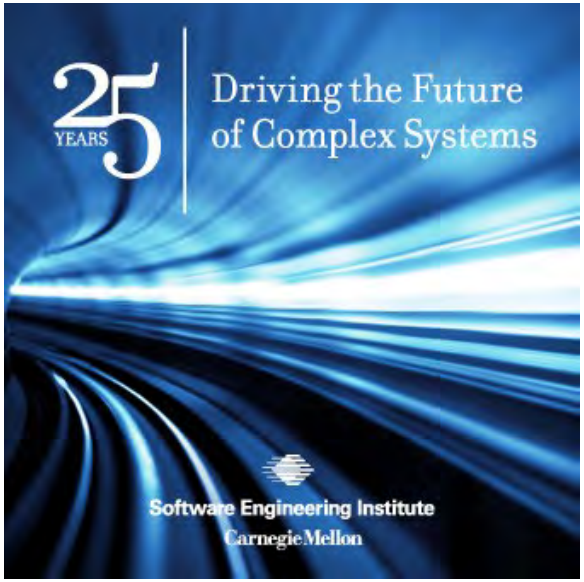
The Personal Software Process (PSP) shows engineers how to

- **manage the quality of their projects**
- **make commitments they can meet**
- **improve estimating and planning**
- **reduce defects in their products**

Because personnel costs constitute 70 percent of the cost of software development, the skills and work habits of engineers largely determine the results of the software development process. Based on practices found in the Capability Maturity Model (CMM), the PSP can be used by engineers as a guide to a disciplined and structured approach to developing software. The PSP is a prerequisite for an organization planning to introduce the TSP.

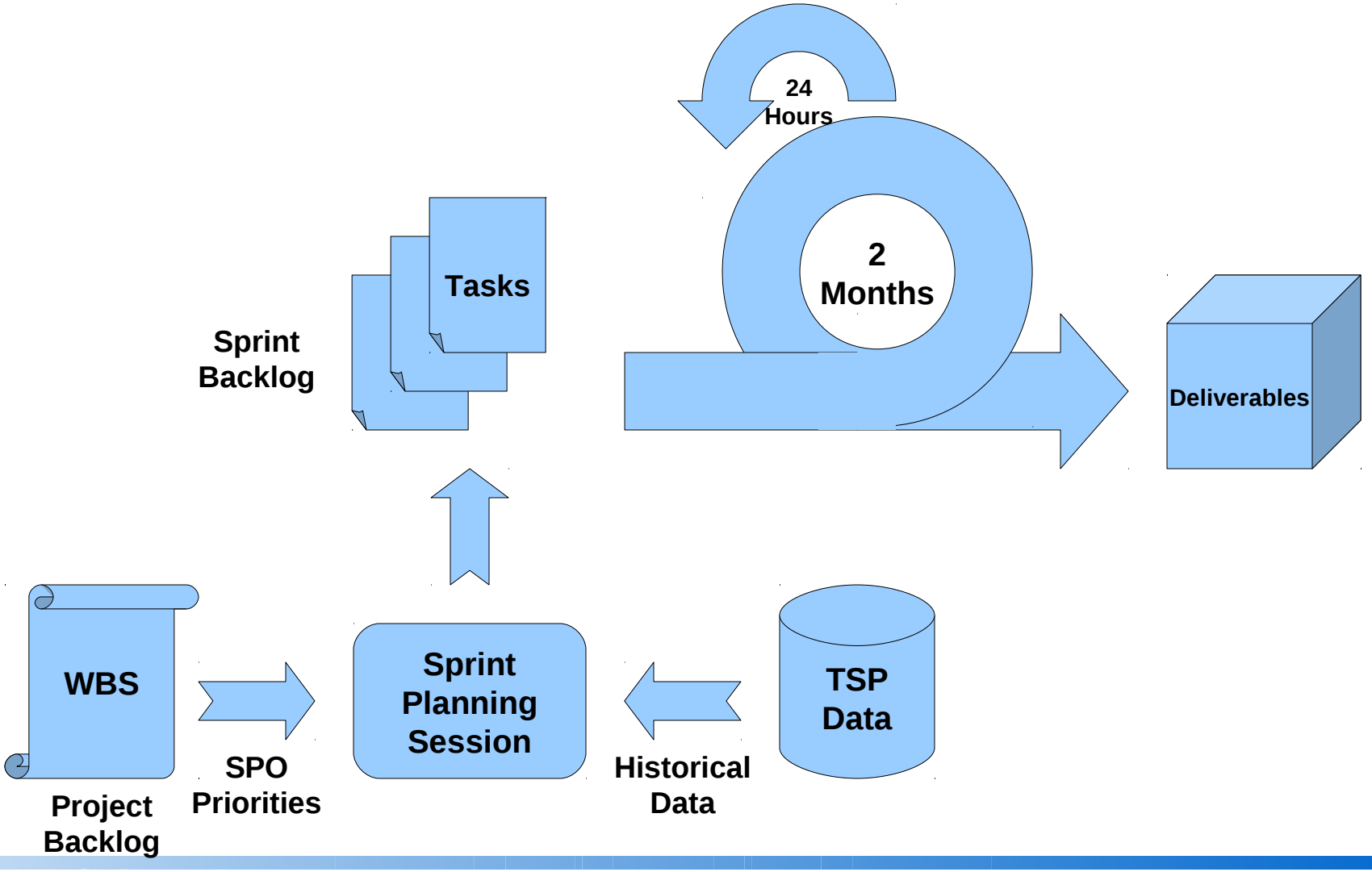
The PSP can be applied to many parts of the software development process, including

- **small-program development**
- **requirement definition**
- **document writing**
- **systems tests**
- **systems maintenance**
- **enhancement of large software systems**



(From the SEI TSP website)

Our Process

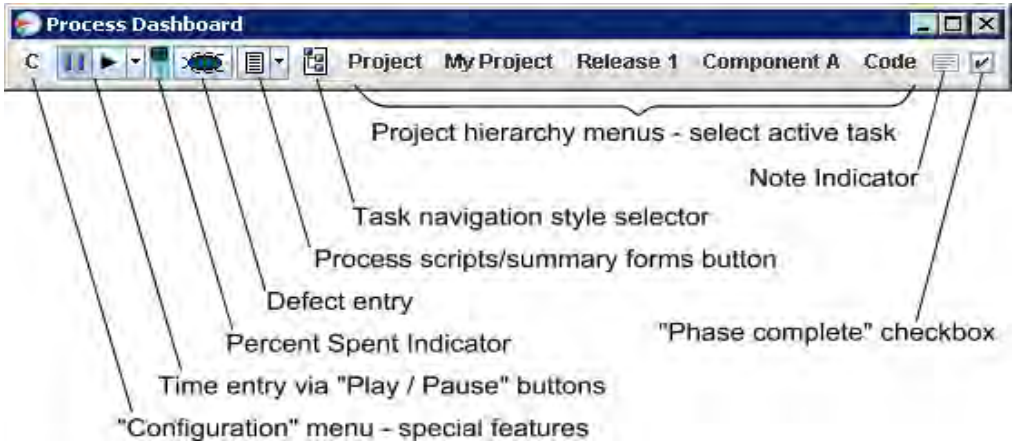

24
Hours
2
Months
Tasks
Sprint
Backlog
Deliverables
WBS
Project
Backlog
SPO
Priorities
Sprint
Planning
Session
Historical
Data
TSP
Data

Our Process

- **Our version of the Scrum lifecycle**
  - **The length of the sprint is defined by the time period between Program Status Reviews (PSRs)**
    - **Typically 2 months**
  - **The project backlog is all of the items in our WBS**
  - **The team uses historical TSP data and engineering judgment to break the WBS items out into the tasks needed to accomplish them and then to fit the tasks into the available task hours in the sprint**
  - **We hold daily standups – except for one day a week when we hold a TSP weekly meeting**

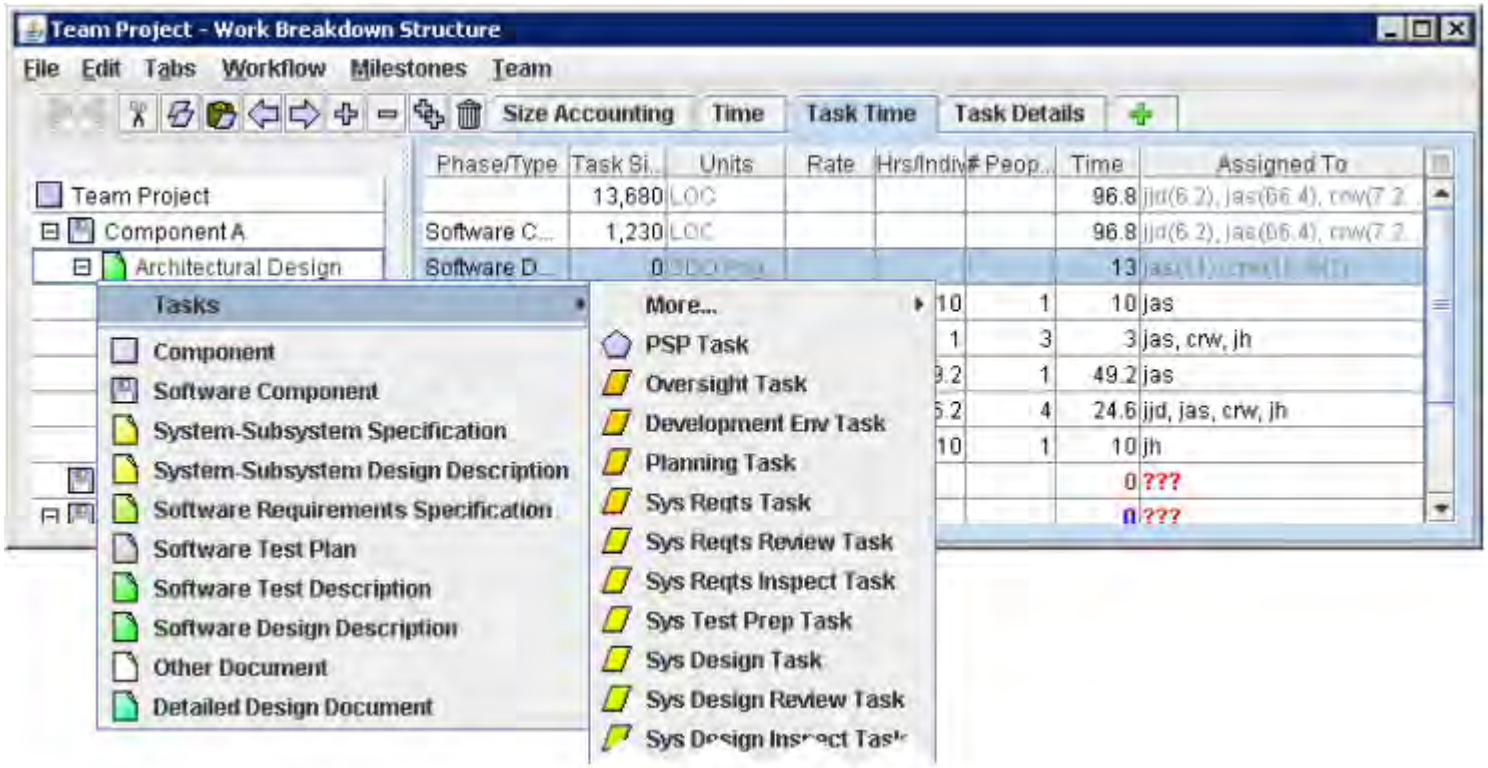
Our Process

- **TSP tool**
  - **The tool we use to automate the rather large amount of data collection required by TSP is the Process Dashboard**
  - **This is an open source Java-based application developed by Tuma Solutions, LLC and is available at www.processdash.com**



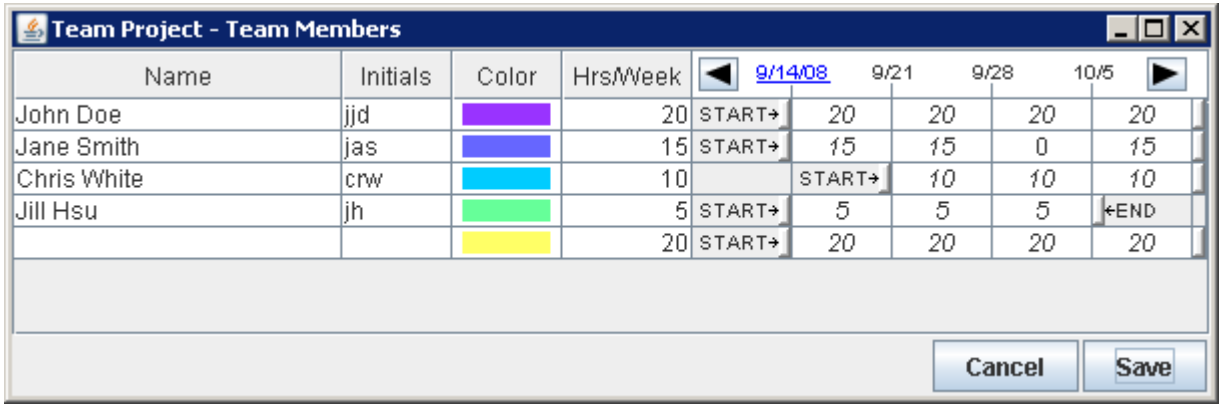
Our Process

Process Dashboard WBS



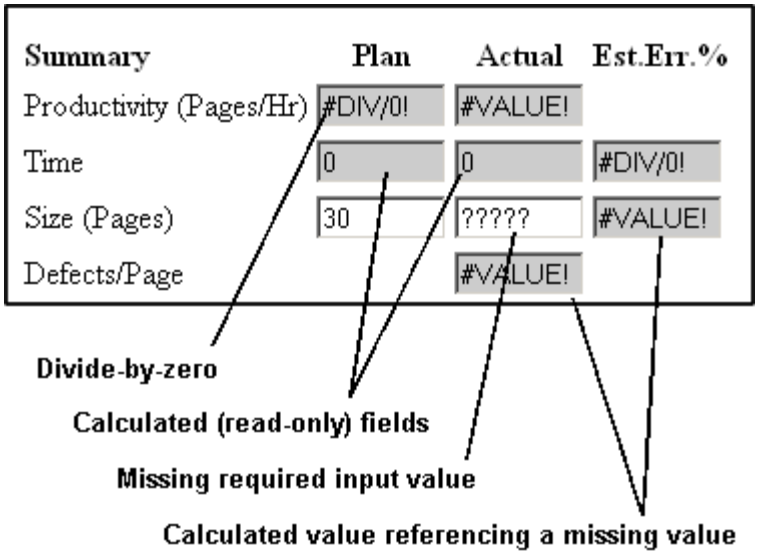
Our Process

- **Process Dashboard Team Members**



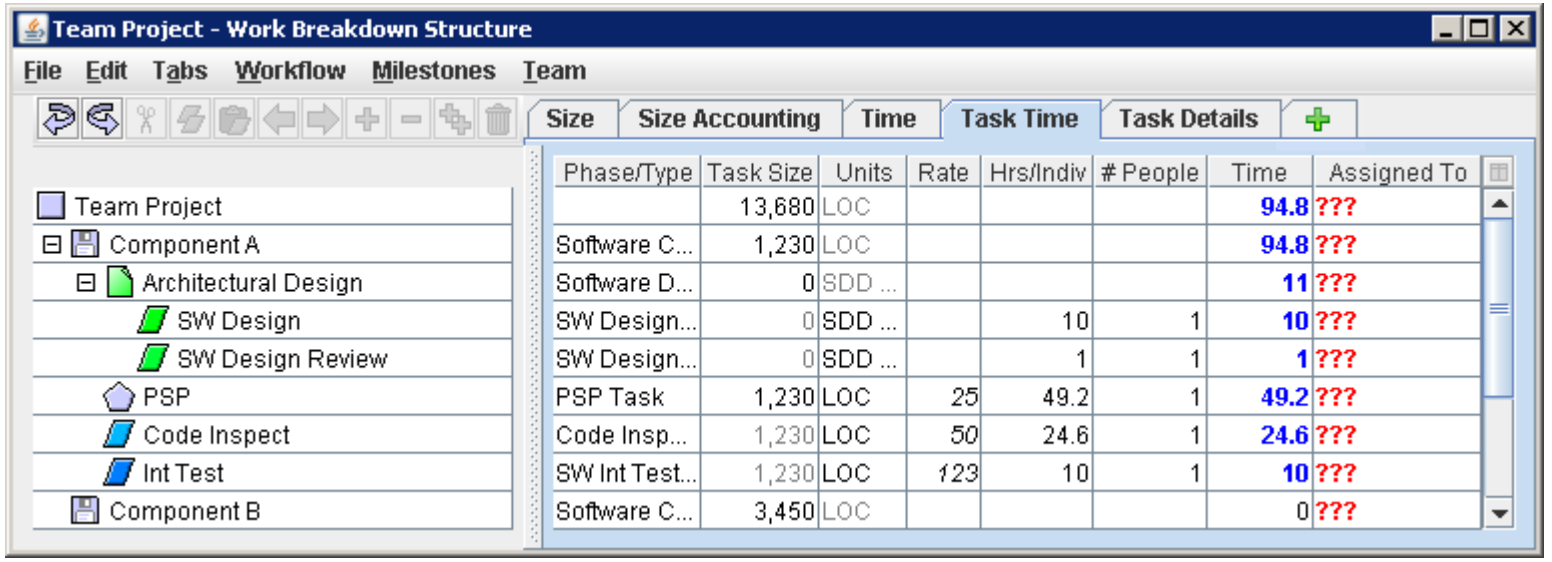
Our Process

- **Process Dashboard Size Estimation**



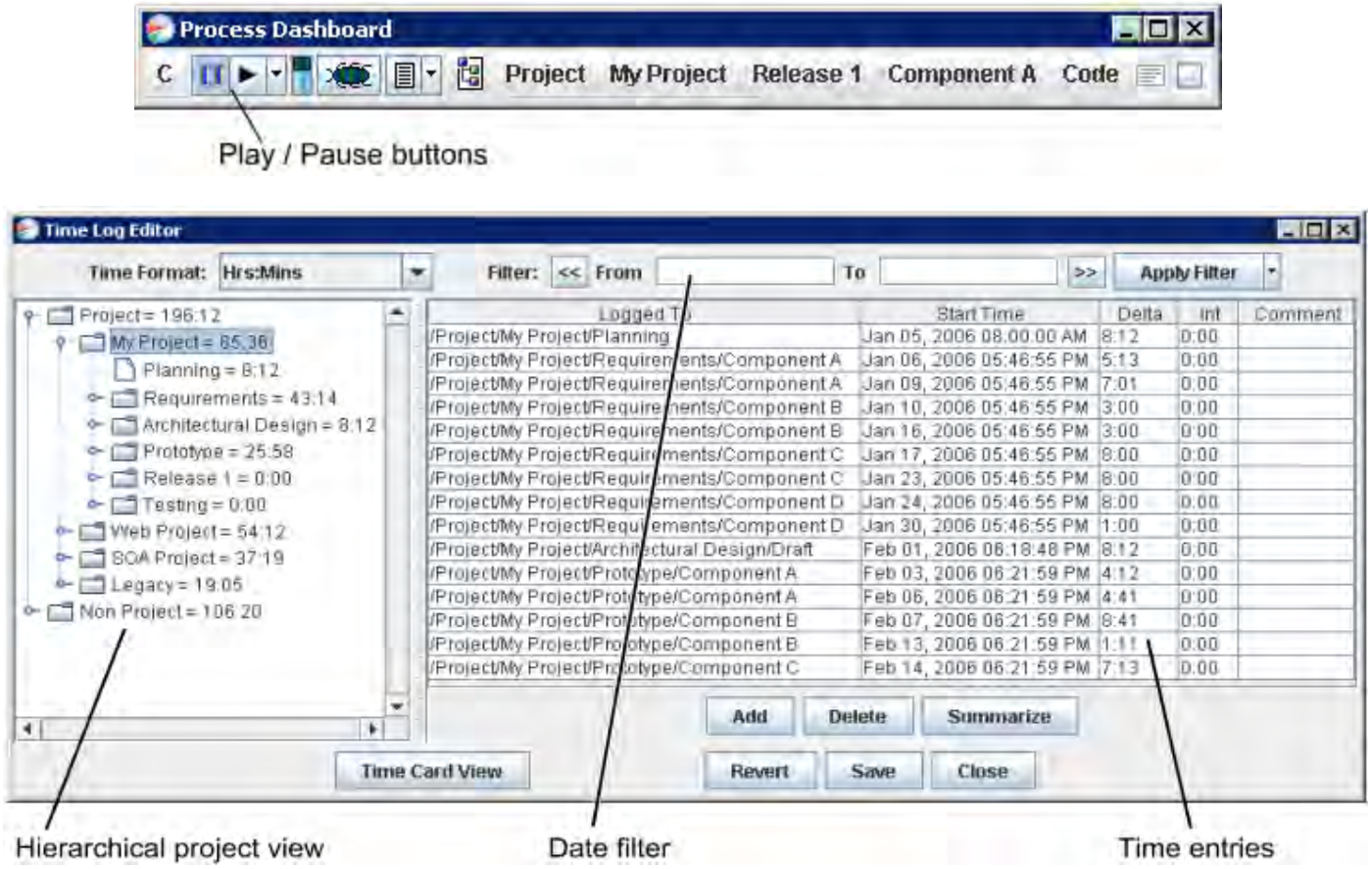
Our Process

- **Process Dashboard Time Estimation**



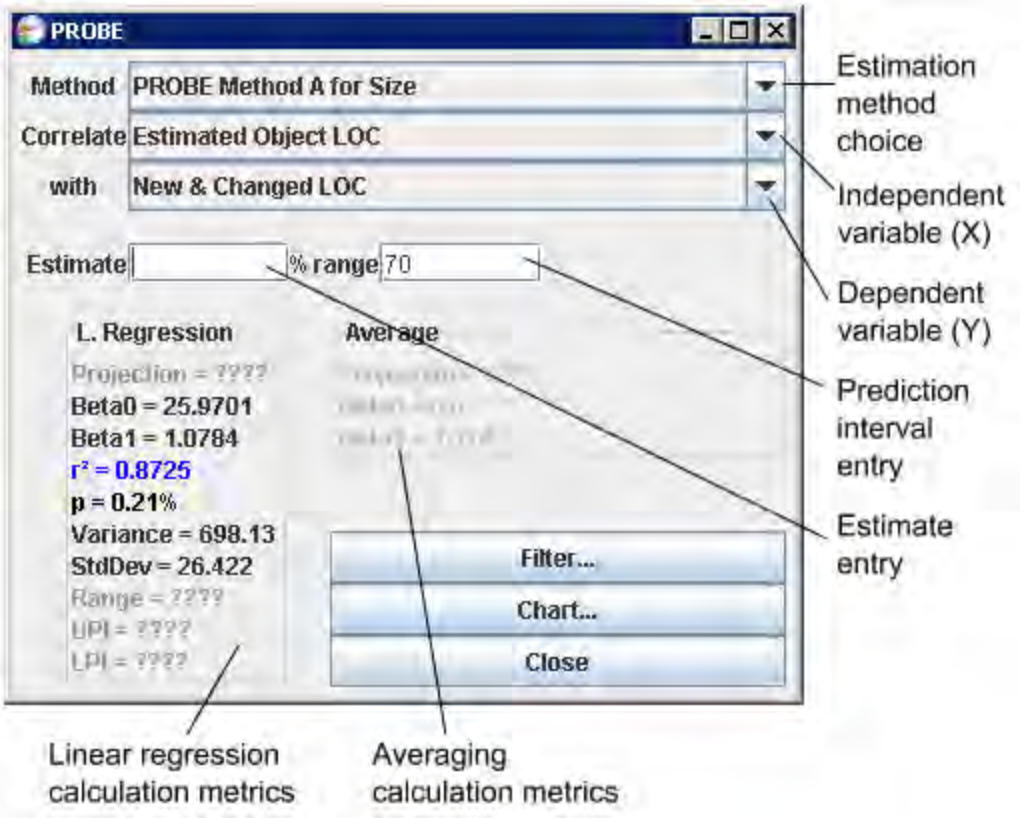
Our Process

Process Dashboard Time Log



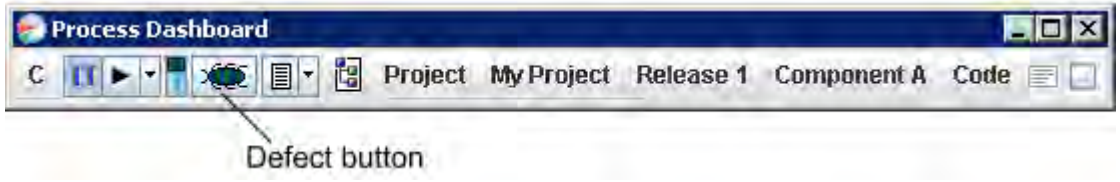
Our Process

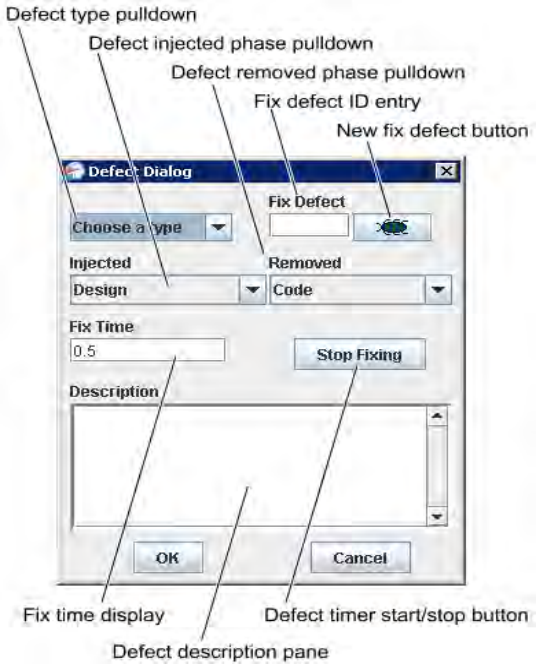
- **Process Dashboard PROBE**

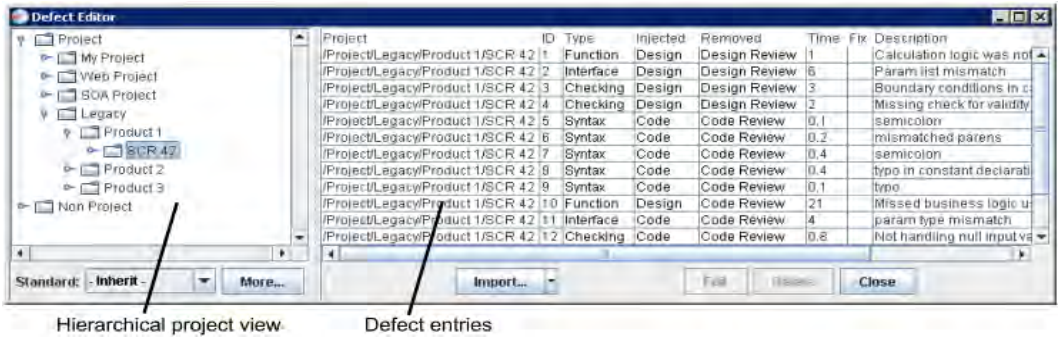


Our Process

Process Dashboard Defect Log

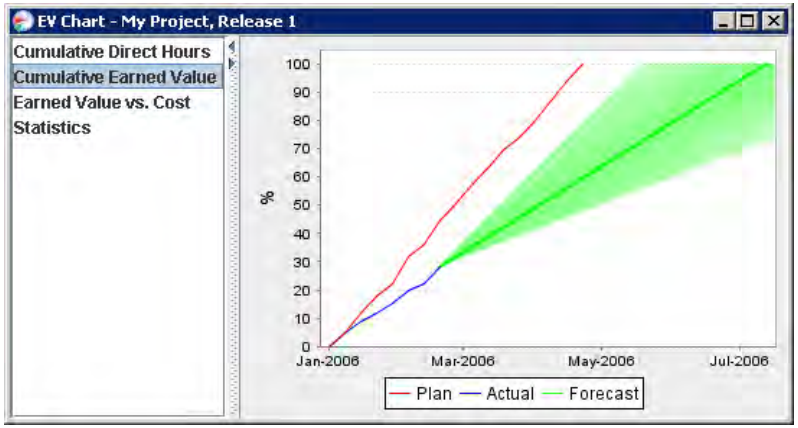


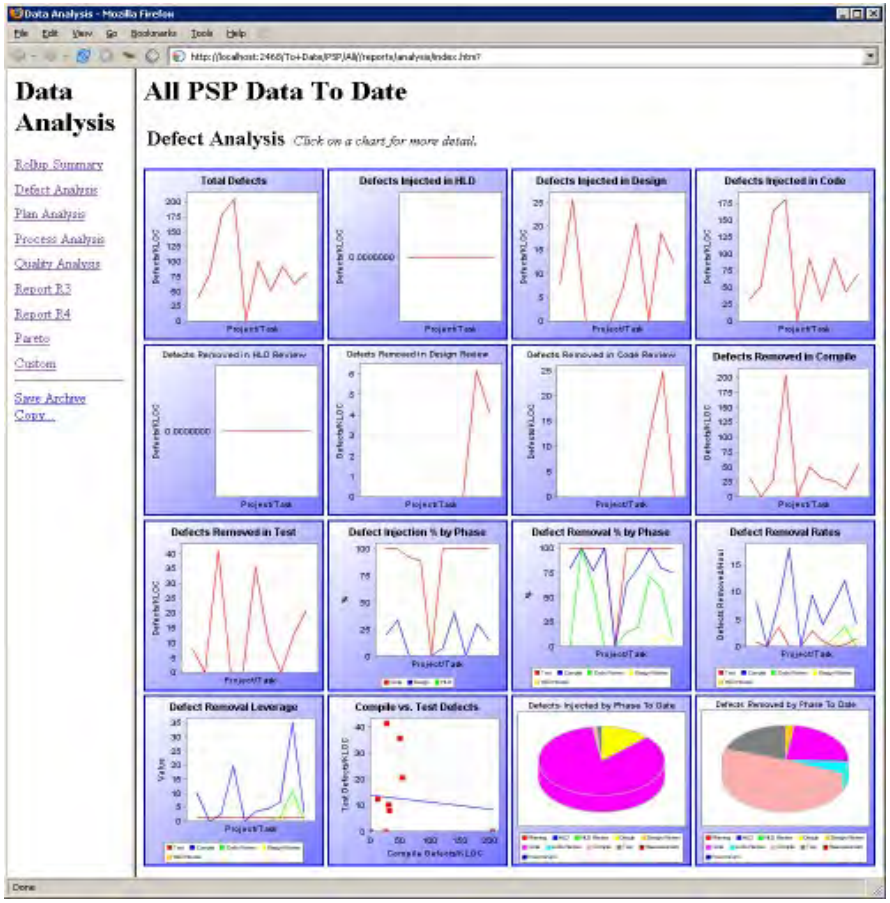




Our Process

- **Process Dashboard Reports**





Our Process

- Sprint planning
  - Using Process Dashboard, each team member enters their planned task hours for the sprint
  - The highest priority tasks are estimated in detail by the team, using historical data
  - The tasks are copied into a new sprint project one by one until the available task hours are used
  - Team members “accept” tasks in the project to create a balanced plan and get a planned value
  - Team members synchronize their dashboards to get the project tasks in their personal dashboards
  - Team members prioritize their tasks by arranging them in the order they plan to work them

Our Process

- Our process and CMMI
  - I believe that our TSP/Scrum integration does support many of the process areas of the CMMI
  - This is an area that needs further research

Successes

- Scrum and TSP integrate very well
  - One weakness of Scrum (in my opinion) is the estimation of backlog tasks
    - Frequently done using “requirements poker”
  - TSP provides a robust set of metrics and effort planning tools
  - Both Scrum and TSP have short time cycles before replanning is required (on the order of months)
  - TSP provides daily status on individual and team performance and can highlight schedule variances in “real time”
    - This feeds into the Scrum daily standup

Successes

- Responsiveness to customer
  - The detailed, yet short-ranged, planning of both Scrum and TSP - combined with the TSP metrics - supports being responsive to the customer
    - Can give accurate estimates of priority changes or “drive by taskings”
  - The customer can adjust priorities every two months as their needs dictate

Successes

- Good metrics
  - With TSP, the team knows
    - How long a task that is familiar will take
    - How long an unfamiliar task similar to a familiar task should take
    - If an estimate was not correct on a daily basis
    - How many task hours each team member can be expected to produce
    - How many defects have been injected by phase
    - How effective the quality steps are and how much effort they require (the cost of quality)
    - EV by team and team member

Successes

- **Better programmatic understanding**
  - **Longer range estimates have more fidelity because they can be gauged against previous estimates**
  - **The effectiveness of process improvements can be judged empirically**
  - **Positive and negative trends become readily apparent and adjustments can be made to continue the positive trends and correct the negative**

Challenges

- It's different!
  - TSP and Scrum were new to the customer
  - TSP is new to many of the teams at OO-ALC
  - Scrum is new to OO-ALC
  - People tend to resist change

Challenges

- **Where's the Gantt chart?**
  - **Customers and managers have been trained by decades of experience to think that they need a Gantt chart to manage a project**
  - **Concepts like backlogs and short duration iterations make them uncomfortable**

Challenges

- **Is this really software engineering?**
  - **To engineers used to having a project plan that runs for the entire length of a project feel that a two month plan is too ad hoc**
    - **Not that it isn't possible to generate a long range plan from the backlog, it just has about as much fidelity as most long range plans**
  - **To engineers used to being assigned tasks by managers used to assigning tasks, the notion of "accepting tasks" and having daily meetings seems too "soft and fuzzy"**
    - **"What, are we going to have a group hug now?"**

Lessons Learned

- **Educate the stakeholders**
  - **Customers, management, process leaders, and team members need to be educated early and often about**
    - **What the new methods are**
    - **How they are different from what they are used to**
    - **How they are the same as what they are used to**
    - **What the advantages of the new methods are**
    - **What the disadvantages of the new methods are**
  - **The team members need to have training in the methodologies (PSP, TSP, and Scrum) before they try to use them**

Lessons Learned

- Avoid too much “agile speak”
  - Agile has it's own vocabulary
  - Many of the agile terms are really just new ways of referring to old or common sense ideas
  - If you can avoid using these unfamiliar terms or you can use them in ways that are more familiar to your audience – do so
  - There's nothing “leading edge” about being misunderstood

Lessons Learned

- Ensure you have buy-in
  - Buy-in from the customer
    - We did this through briefings to the customer and through a one-day scrum workshop
  - Buy-in from management
    - Done through ongoing education and by trying to demonstrate the value of Scrum and TSP
  - Buy-in from the team
    - Most essential
    - Engineers have a tendency to be skeptical and resistant to change
    - Need to see the benefits for themselves before they'll accept something new

Lessons Learned

As in any team endeavor, effective communication is essential!

The Future?

- **The future for Sprint and TSP integration in CCS-C sustainment at OO-ALC is**

Uncertain!

Questions?

References

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Acronym List

AFB	Air Force Base
AFMC	Air Force Material Command
AFSPC	Air Force Space Command
CCS-C	Command and Control System – Consolidated
CMMI	Capability Maturity Model Integration
CMU	Carnegie Mellon University
OO-ALC	Ogden Air Logistics Center
PSP	Personal Software Process
SEI	Software Engineering Institute
SMC	Space and Missile Systems Center
SMXG	Software Maintenance Group
TSP	Team Software Process